

SOUND ABSORPTION COEFFICIENTS of Architectural Acoustical Materials

ACOUSTICAL MATERIALS ASSOCIATION

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THE ACOUSTICAL MATERIALS ASSOCIATION

The Acoustical Materials Association is an organization formed by manufacturers of architectural acoustical materials for the purpose of furnishing architects and others with reliable technical data on sound absorbing materials and their uses.

All manufacturers of such materials are invited to apply for membership in the Association.

This bulletin is published periodically so that up-to-date information on products manufactured by Association members is readily available. Interim reports may be made from time to time as new materials are introduced and tested, and will appear on the Association letterhead.

MEMBERS

ARMSTRONG CORK COMPANY
Lancaster, Pennsylvania

THE CELOTEX CORPORATION
120 South La Salle St., Chicago 3, Ill.

THE E. F. HAUSERMAN COMPANY
Cleveland 5, Ohio

JOHNS-MANVILLE SALES CORPORATION
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NATIONAL GYPSUM COMPANY
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Toledo, Ohio

SIMPSON INDUSTRIES
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UNITED STATES GYPSUM COMPANY
300 West Adams Street, Chicago 6, Ill.

Information regarding the Association and its activities can be obtained from the members or their local representatives or by addressing Acoustical Materials Association, 205 West Monroe St., Chicago, Ill.

A. M. A. SOUND ABSORPTION COEFFICIENTS

The sound absorption coefficient of a material is a measure of its efficiency as a sound absorbent which will serve as a basis for computations of reverberation times and of noise reduction.

The tables of coefficients presented in the following pages give the results of tests all made under identical conditions in one laboratory. Sound absorption coefficients are customarily reported and published for the six frequencies—each an octave apart—from 128

cycles per second, to 4,096 cycles per second inclusive.

The test data contained herein have all been obtained under identical conditions and are, therefore, comparable. The Association does not wish to discredit other data but, recognizing the confusing differences which have existed in the past, believes that a single set of values approved by all members of the Association is preferable.

APPLICATION OF MATERIALS

Acoustical materials are properly classified as "Building Specialties" and their installation is best placed in the hands of the persons familiar with them. Members of the AMA

will gladly refer architects and builders to representatives in all localities who are skilled in the application of their products.

RATING OF MATERIALS

In order not to emphasize unduly the precise value of the absorption coefficient of a material, it should be borne in mind that experiments may, at certain frequencies, depart from the mean of a large number of measure-

ments by as much as 7% of the mean value. Minor differences in coefficients, therefore, should not be considered a serious matter in the selection of materials, and attention given to the many other properties of the materials.

PERFORMANCE

All test data listed are on currently manufactured material and each member company

is pledged to maintain the efficiency of his products as listed.

Alphabetical List of Trade Names

For convenient reference, the trade names of materials appearing in this bulletin are listed below in alphabetical order together with name of the manufacturer. Tables showing sound absorption coefficients and other physical characteristics of each material will be found on pages indicated.

TRADE NAME	MANUFACTURER	PAGE
ACOUSTEEL*	The Celotex Corporation	7
ACOUSTI-CELOTEX*	The Celotex Corporation	7
ACOUSTIFIBRE*	National Gypsum Company	9
ACOUSTIMETAL*	National Gypsum Company	9
ACOUSTONE*	United States Gypsum Company	10
AIRACOUSTIC*	Johns-Manville Sales Corporation	8
ARRESTONE*	Armstrong Cork Company	6
AUDITONE*	United States Gypsum Company	10
CORKOUSTIC*	Armstrong Cork Company	6
CUSHIONTONE*	Armstrong Cork Company	6
ECONACOUSTIC*	National Gypsum Company	9
FIBERGLAS* ACOUSTICAL TILE	Owens-Corning Fiberglas Corporation	9
FIBRACOUSTIC	Johns-Manville Sales Corporation	8
FIBRETEX	Johns-Manville Sales Corporation	8
FIBRETONE*	Johns-Manville Sales Corporation	8
MINERAL WOOL ACOUSTICAL MATERIAL	Armstrong Cork Company	6
MUFFLETONE*	The Celotex Corporation	7
SANACOUSTIC*	Johns-Manville Sales Corporation	8
SIMPSON ACOUSTICAL TILE	Simpson Industries	10
SOUND ISOLATION BLANKET	Johns-Manville Sales Corporation	8
TRANSITE* ACOUSTICAL PANELS	Johns-Manville Sales Corporation	8
TRAVERTONE	Armstrong Cork Company	6

*T. M. REG. U. S. PAT. OFF.

LIGHT REFLECTION VALUES

All light reflection values on acoustical materials listed in the following tables are obtained from tests conducted at a laboratory chosen by the Association. The tests are made on samples selected by a representative of the testing laboratory as typical of the actual material submitted for sound absorption tests. The light reflection is measured in a type of reflectometer known as the "Baumgartner sphere" described in the "Transactions of the Illuminating Engineering Society," 33, 379 (1938). Each value reported is the average of measurements on four (4) samples.

The letter appearing in the tables under the column heading "Color" indicates the color of the sample which gave the light reflection value in the adjoining column, in accordance with the following table:

W—White

I—Ivory

Wp—White, perforated. This symbol used only when surface is combination of perforated and unperforated units.

Wu—White, unperforated. This symbol used only when surface is combination of perforated and unperforated units.

THICKNESSES

Unless otherwise noted, the thickness given is the thickness of the sound-absorbing element forming the face of the construction.

The thickness of other sound-absorbing elements in the construction, if used, is indicated by the type of mounting.

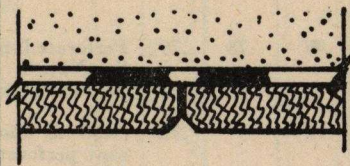
NOISE REDUCTION COEFFICIENTS

The noise reduction coefficient is the average of the coefficients at frequencies from 256 to 2048 cycles inclusive, given to the nearest 5%. This average coefficient is recommended for use in comparing materials to be applied in offices, hospitals, banks, corridors, etc.

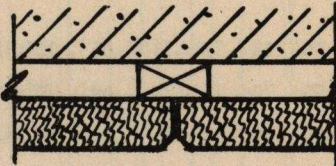
For auditorium treatment, attention should be directed to the coefficients at 512 cycles and other frequencies as explained in "Theory and Use" bulletin published by the Association.

TYPES OF MOUNTING

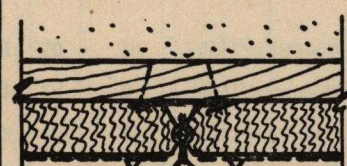
(Used in Conducting Sound Absorption Tests)



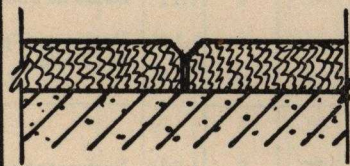
1. Cemented to plaster board. Considered equivalent to cementing to plaster or concrete ceiling.



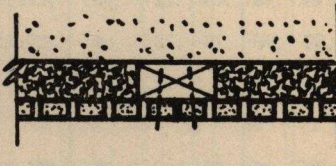
2. Nailed to 1" x 2" wood furring 12" o.c. unless otherwise indicated.



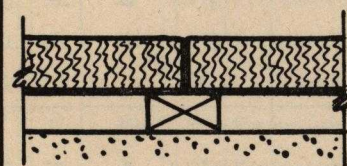
3. Attached to metal supports applied to 1" x 2" wood furring.



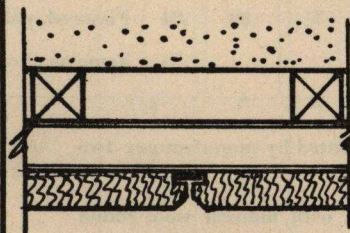
4. Laid directly on laboratory floor.



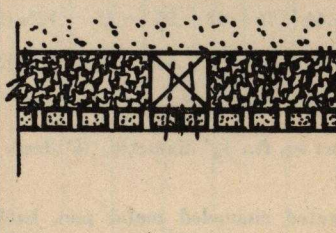
5. Nailed to 1" x 3" wood furring 24" o.c. and filled in between furring with 1" mineral wool.



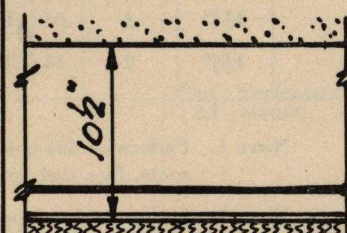
6. Laid on 24 ga. sheet iron, nailed to 1" x 2" wood furring 24" o.c.



7. Attached to special metal supports mounted on 2" x 2" wood furring.



8. Nailed to 2" x 2" wood furring 24" o.c. 2" mineral wool between furring.



9. Mechanically mounted to metal furring strips 24" o.c. 10½" from boundary surface of Sound Chamber.

ARMSTRONG CORK COMPANY

MATERIAL	Thick- ness (See Page 4)	Mount- ing (See Page 5)	COEFFICIENTS						Noise Red. Coef. (See Page 4)	Unit Size Tested	Light Reflection		Wt. Lbs. per Sq. Ft.	SURFACE	Test No.
			128	256	512	1024	2048	4096			Color	Value			
CUSHIONTONE															
A	1/2"	1	.05	.18	.56	.76	.77	.73	.55	12"x12"	W	.78	.79	Perforated, painted See Note 1	46-109
A	1/2"	2	.07	.47	.55	.70	.77	.74	.60	12"x12"			.79	Same as above	46-108
A	5/8"	1	.09	.25	.60	.80	.78	.73	.60	12"x12"			.92	Same as above ex- cept perforations 1/2" deep	46-116
A	5/8"	2	.13	.45	.55	.73	.79	.75	.65	12"x12"			.92	Same as above	46-115
A	3/4"	1	.10	.28	.66	.91	.82	.69	.65	12"x12"			1.05	Same as above ex- cept perforations 5/8" deep	47-28
A	3/4"	2	.14	.51	.59	.87	.81	.70	.70	12"x12"			1.05	Same as above	47-27
A	7/8"	1	.09	.28	.74	.98	.78	.70	.70	12"x12"			1.17	Same as above ex- cept perforations 3/4" deep	46-118
A	7/8"	2	.17	.51	.73	.95	.75	.72	.75	12"x12"			1.17	Same as above	46-117
F	3/4"	1	.05	.14	.55	.90	.78	.78	.60	12"x12"			1.13	Perforated, painted See Note 3	46-114
ARRESTONE Absorbing Pads Plus metal facing Plus furring	1 1/4" 1 5/8" 2 1/2"	3	.25	.56	.99	.99	.77	.60	.85	12"x24"	W		1.20	Perforated, enameled metal. See Note 2	46-10
TRAVERTONE	3/4"	1	.12	.27	.72	.79	.76	.77	.65	12"x12"	W		1.13	Fissured, painted	46-110
CORKOUSTIC															
	1 1/2"	1	.04	.13	.44	.76	.43	.55	.45	12"x12"	W	.80	.84	Fissured, painted	A47-95
	1 1/2"	2	.14	.25	.61	.43	.52	.54	.45	12"x12"			.84	Same as above	A47-94

NOTE 1. Perforated 484 holes per sq. ft., 3/16" diameter, 1/16" deep. Painted by manufacturer two coats, face and bevels.

NOTE 2. Arrestone is a perforated enameled metal pan, backed with mineral wool sound absorbing pad. Perforations are .093" diameter, 1105 holes per sq. ft. Bevels and flanges unperforated.

NOTE 3. Perforated 484 holes per sq. ft., 5/32" diameter, 5/8" deep.

THE CELOTEX CORPORATION

MATERIAL	Thick- ness (See Page 4)	Mount- ing (See Page 5)	COEFFICIENTS						Noise Red. Coef. (See Page 4)	Unit Size Tested	Light Reflection		Wt. Lbs. per Sq. Ft.	SURFACE	Test No.
			128	256	512	1024	2048	4096			Color	Value			
ACOUSTI-CELOTEX															
Type CS-1	½"	1	.09	.15	.61	.77	.70	.64	.55	12"x12"	I	.78	.66	Perforated ¹ , painted ²	46-58
Type CS-1	½"	2	.14	.46	.52	.71	.72	.64	.60	12"x12"			.66	Perforated ¹ , painted ²	46-57
Type C-2	⅝"	1	.09	.26	.69	.86	.67	.62	.60	12"x12"	I	.78	.83	Perforated ¹ , painted ³	A47-76
Type C-2	⅝"	2	.12	.51	.65	.73	.66	.58	.65	12"x12"			.83	Perforated ¹ , painted ²	A47-75
Type C-4	1¼"	1	.14	.42	.99	.74	.60	.50	.70	12"x12"	I	.78	1.34	Perforated ¹ , painted ²	47-4
Type C-4	1¼"	2	.25	.58	.99	.75	.58	.50	.75	12"x12"			1.34	Perforated ¹ , painted ²	47-3
Type C-4	1¼"	7	.53	.58	.93	.70	.55	.48	.70	12"x24"	W	.81	1.58	Perforated ¹ , painted ³	46-65
Type C-6	1¼"	1	.15	.34	.99	.94	.61	.61	.70	12"x12"	W	.76	1.51	Perforated ⁴ , painted ³	46-64
Type C-6	1¼"	2	.27	.57	.91	.91	.67	.58	.75	12"x12"			1.51	Perforated ⁴ , painted ³	46-63
Type C-7	1"	7	.41	.48	.68	.79	.75	.55	.70	12"x24"	I	.78	1.40	Perforated ¹ , painted ²	46-66
Type C-8	1"	2	.25	.49	.69	.78	.61	.48	.65	24"x24"	W	.81	1.54	Perforated ¹ , painted ³	46-39
Type C-9	¾"	1	.11	.23	.80	.93	.58	.50	.65	12"x12"	I	.78	.96	Perforated ¹ , painted ²	46-132
Type C-9	¾"	2	.12	.45	.79	.89	.61	.60	.70	12"x12"			.96	Perforated ¹ , painted ²	46-131
Type M-1	⅝"	1	.07	.21	.64	.86	.93	.83	.65	12"x12"	W	.80	1.31	Perforated ⁵ , painted ³	46-12
Type M-1	⅝"	2	.12	.48	.50	.79	.93	.82	.70	12"x12"			1.31	Perforated ⁵ , painted ³	46-11
Type M-2	1"	1	.08	.27	.92	.95	.80	.71	.75	12"x12"	W	.80	1.81	Perforated ⁵ , painted ³	46-44
Type M-2	1"	7	.40	.44	.79	.99	.77	.71	.75	12"x24"	W	.80	2.23	Perforated ⁵ , painted ³	46-130
MUFFLETONE															
Standard	1"	1	.12	.30	.74	.76	.71	.67	.65	12"x12"			1.80	Integrally colored	46-24
Fissured	1"	1	.09	.29	.83	.97	.77	.71	.70	12"x12"			1.92	Integrally colored	46-67
ACOUSTEEL															
Pad	1¼"	3	.25	.52	.99	.99	.81	.60	.85	12"x24"			{Pad 1.08	Perforated, enameled metal ⁶ .	46-13
Plus Spacers and metal facing }	1⅝"														
Plus furring	2½"														

NOTE 1. Perforated 441 holes per sq. ft., 3/16" in diameter, 17/32" o.c.

NOTE 2. Face painted before perforating.

NOTE 3. Painted after perforating.

NOTE 4. Perforated 441 holes per sq. ft., 1/4" in diameter, 17/32" o.c.

NOTE 5. Perforated 676 holes per sq. ft., 5/32" in diameter, 7/16" o.c.

NOTE 6. Acousteel is a perforated, enamelled metal pan backed with mineral wool sound absorbing pad. Perforations are .093" diameter, 1105 holes per sq. ft. Bevels and flanges unperforated.

JOHNS-MANVILLE CORPORATION

MATERIAL	Thick- ness (See Page 4)	Mount- ing (See Page 5)	COEFFICIENTS							Noise Red. Coef. (See Page 4)	Unit Size Tested	Light Reflection		Wt. Lbs. per Sq. Ft.	SURFACE	Test No.
			128	256	512	1024	2048	4096	Color			Value				
SANACOUSTIC Type KK, pad Plus metal facing and pad supports Plus furring	1¼" 1⅞" 2½"	3	.25	.58	.96	.97	.85	.72	.85	12"x24"	W	.76	Pad 1.28	Perforated,enameled metal. See Note 1	46-88	
TRANSITE ACOUSTICAL PANELS Rock Wool Blanket Plus perforated Transite	1" 1⅜"	5	.17	.49	.94	.90	.70	.43	.75	—	—	—	1.20	Perforated, unpaint- ed. See Note 2	46-77	
Rock Wool Blanket Plus perforated Transite	2" 2⅜"	8	.29	.57	.94	.93	.70	.48	.80	—	—	—	2.00	Same as above	46-43	
TRANSITE ACOUSTICAL UNIT, pad	1" 1⅞"	2	.32	.58	.72	.85	.76	.67	.75	12"x12"	W	—	2.60	Perforated, painted See Note 3	47-45	
FIBRACOUSTIC	1" 1"	1 2	.18 .25	.42 .62	.81 .72	.75 .72	.71 .71	.72 .76	.65 .70	12"x12" 12"x12"	W W	.58 .58	.54 .54	Painted Painted	46-105 46-104	
SOUND ISOLATION Blanket MK Blanket MK	1" 2"	4 4	.22 .39	.46 .57	.86 .91	.98 .91	.88 .80	.77 .78	.80 .80	— —	— —	— —	1.20 2.00	} Covered with mus- lin, unpainted	46-73 46-42	
FIBREONE	1½" 1⅜" 1⅝"	1 1 2	.08 .14 .18	.28 .37 .54	.58 .69 .72	.71 .80 .74	.68 .76 .71	.65 .73 .72	.55 .65 .70	12"x12" 12"x12" 12"x12"	W W W	.71 .71 .71	.75 1.17 1.17		Perforated, painted See Note 4 See Note 5 See Note 5	47-47 46-124 46-123
AIRACOUSTIC	1½" 1"	6 6	.13 .29	.41 .51	.40 .70	.72 .82	.78 .79	.72 .80	.60 .70	24"x36" 24"x36"	— —	— —	.80 1.50	Unpainted Unpainted	46-70 46-71	

NOTE 1. Sanacoustic is a perforated, enameled metal pan backed with mineral wool sound-absorbing pad. Perforations are .068" in diameter, 4608 holes per sq. ft.

NOTE 2. Holes are 3/16" in diameter, 600 per sq. ft.

NOTE 3. Holes are 5/32" in diameter, 576 per sq. ft.

NOTE 4. Holes are 3/16" in diameter, 3/8" deep, 484 per sq. ft.

NOTE 5. Holes are 3/16" in diameter, 1/16" deep, 484 per sq. ft.

NATIONAL GYPSUM COMPANY

MATERIAL	Thick- ness (See Page 4)	Mount- ing (See Page 5)	COEFFICIENTS						Noise Red. Coef. (See Page 4)	Unit Size Tested	Light Reflection		Wt. Lbs. per Sq. Ft.	SURFACE	Test No.
			128	256	512	1024	2048	4096			Color	Value			
ACOUSTIFIBRE	$\frac{5}{8}$ "	1	.10	.16	.62	.97	.81	.73	.65	12"x12"			.56	Perforated, painted See Note 1	46-137
		2	.13	.38	.72	.89	.82	.66	.70	12"x12"					46-136
ECONACOUSTIC	$\frac{1}{2}$ "	1	.05	.17	.62	.83	.77	.74	.60	12"x12"			.40	Painted	46-135
	$\frac{1}{2}$ "	2	.09	.32	.75	.78	.74	.78	.65	12"x12"			.40	Painted	46-134
	1"	1	.13	.43	.78	.81	.75	.81	.70	12"x12"			.62	Painted	A47-49
ACOUSTIMETAL Type P pad Plus spacer and metal facing Plus furring	$1\frac{1}{4}$ " $1\frac{5}{8}$ " $2\frac{1}{2}$ "	3	.26	.47	.97	.99	.88	.88	.85	12"x24"	W	.72	Pad .91	Perforated,enameled metal. See Note 2	46-06

NOTE 1. Acoustifibre is perforated with holes $\frac{3}{16}$ " in diameter, $\frac{5}{16}$ " deep, 441 per sq. ft.

NOTE 2. Acoustimetal is a perforated, enameled metal pan backed with sound absorbing mineral wool pad. Perforations are .093" in diameter, 2016 per sq. ft.

OWENS-CORNING FIBERGLAS CORPORATION

MATERIAL	Thick- ness (See Page 4)	Mount- ing (See Page 5)	COEFFICIENTS						Noise Red. Coef. (See Page 4)	Unit Size Tested	Light Reflection		Wt. Lbs. per Sq. Ft.	SURFACE	Test No.
			128	256	512	1024	2048	4096			Color	Value			
FIBERGLAS ACOUSTICAL TILE															
Type A	$\frac{3}{4}$ "	1	.12	.32	.75	.83	.70	.63	.65	12"x12"	W	—	.67	Factory painted felted mineral with fiber surface	A48-2
Type A	$\frac{3}{4}$ "	2	.08	.44	.79	.83	.74	.65	.70	12"x12"	W	—	.67		A48-1
Type A	$\frac{3}{4}$ "	9	.47	.65	.75	.84	.83	.81	.75	24"x24"	W	—	—		A48-7
Type A	1"	1	.11	.31	.79	.94	.84	.79	.70	12"x12"	W	—	.94		A48-4
Type A	1"	2	.17	.40	.83	.96	.85	.83	.75	12"x12"	W	—	.94		A48-3
Type A	1"	9	.51	.52	.75	.87	.89	.91	.75	24"x24"	W	—	.90		A48-5

MEMORANDA

COMPARISONS OF GENERAL BUILDING MATERIALS

The following table compares the general building materials used in the construction of the various types of buildings. The materials are listed in the following order: 1. Foundation, 2. Walls, 3. Floors, 4. Roofs, 5. Windows, 6. Doors, 7. Stairs, 8. Elevators, 9. Piping, 10. Electrical, 11. Mechanical, 12. Other.

Material	Foundation	Walls	Floors	Roofs	Windows	Doors	Stairs	Elevators	Piping	Electrical	Mechanical	Other
Concrete	100	80	70	60	50	40	30	20	10	5	5	5
Brick	80	70	60	50	40	30	20	10	5	5	5	5
Stone	60	50	40	30	20	10	5	5	5	5	5	5
Wood	40	30	20	10	5	5	5	5	5	5	5	5
Steel	20	10	5	5	5	5	5	5	5	5	5	5
Aluminum	10	5	5	5	5	5	5	5	5	5	5	5
Plastic	5	5	5	5	5	5	5	5	5	5	5	5
Glass	5	5	5	5	5	5	5	5	5	5	5	5
Insulation	5	5	5	5	5	5	5	5	5	5	5	5
Paint	5	5	5	5	5	5	5	5	5	5	5	5
Sealant	5	5	5	5	5	5	5	5	5	5	5	5
Fasteners	5	5	5	5	5	5	5	5	5	5	5	5
Tools	5	5	5	5	5	5	5	5	5	5	5	5
Other	5	5	5	5	5	5	5	5	5	5	5	5

ABSORPTION OF HEAT AND MOISTURE

Material	Heat Absorption	Moisture Absorption
Concrete	100	80
Brick	80	70
Stone	60	50
Wood	40	30
Steel	20	10
Aluminum	10	5
Plastic	5	5
Glass	5	5
Insulation	5	5
Paint	5	5
Sealant	5	5
Fasteners	5	5
Tools	5	5
Other	5	5

